ORNL/CSD/TM-5

A USER'S MANUAL FOR ADPLOT:

A PROGRAM FOR PLOTTING NUMERICAL DATA FROM ADSEP DATA SETS

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OPERATED BY UNION CARBIDE CORPORATION FOR THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

Printed in the United States of America. Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road, Springfield, Virginia 22161
Price: Printed Copy $4.00; Microfiche $3.00

ORNL/CSD/TM-5

Contract No. W-7405-eng-26

COMPUTER SCIENCES DIVISION

A USER'S MANUAL FOR ADPLOT: A PROGRAM FOR PLOTTING NUMERICAL DATA FROM ADSEP DATA SETS

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NOTICE

This document contains information of a preliminary nature. It is subject to revision or correction and therefore does not represent a final report.

Date Published - February 1977

UNION CARBIDE CORPORATION, NUCLEAR DIVISION
operating the
Oak Ridge Gaseous Diffusion Plant . Oak Ridge National Laboratory
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for the
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

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TABLE OF CONTENTS

LIST OF FIGURES

ABSTRACT

A FORTRAN program is presented which extracts numerical data from ADSEP data sets and draws CALCOMP plots. Complete instructions are given for the use of the program. The available options include labeling of coordinate axes, control of the length of axes, transformation of data, and superposition of data from different data sets.

INTRODUCTION

The program ADSEP[1] performs the automated editing and storage of information in self-defining records. This editing facilitates automated search and retrieval capability for such data sets. Heretofore, this program has been applied most frequently to bibliographic data. More recently, the automated storage and retrieval of numerically oriented data has received more attention. It is therefore desirable to have a program which generates graphs from ADSEP data sets. This report describes the program ADPLOT which extracts data from ADSEP data sets and generates CALCOMP plots. This program forms a part of the ORCHIS[3] Information System.

USE OF PROGRAM ADPLOT

Ordinarily the user will begin by using a program, such as ORLOOK[2], to isolate and save the data he wished to plot from a larger data base. Such a procedure is amply described in Reference (2), and this report will assume that the relevant data are already stored on a suitable device.

ADPLOT (a FORTRAN program) is intended to be a simple yet flexible means of producing, from such data sets, plots which will be suitable for reproduction. Simplicity is achieved by the provision of defaults wherever practical; hence, very little input data is absolutely necessary. On the other hand, the user may determine labels for the axis, a caption for the graph, the length of each axis, and the

maximum and minimum for each axis among other things. The following is a list of the input variables and a brief description of each.

FIRST CARD

LABEL - sixteen characters for data set name. If a name is entered, the program will check to see if the correct data set is being accessed. The field may be left blank if no checking is desired (Columns 1-16, A format).

IDSN - data set identification number. The number will be checked if one is entered; if the field is left blank, no checking is done (Columns 21-30, I format).

*XFIELD - the identifier of the data field whose contents will become the *X* axis (Columns 33-40, A format).

ITMNØX - position of the "*X*" datum in the list. If the data field is a list, specify the number of the item in the list. The field may be left blank if the first item is to be used. If a negative number is found, the entire list will be plotted (right justified in Columns 41-45, I format).

*YFIELD - the identifier of the field whose contents will become the *Y* coordinate of the data points (Columns 53-60, A format).

ITMNØY - position of the "*Y*" datum in the list. If the field is a list, specify the number of the item in the list. As with the *X* axis, the field may be left blank if the first item is

*Only those fields marked are absolutely necessary. All others can be supplied by default if the user desires.

to be used. If a negative number is found, the entire list will be plotted (right justified in Columns 61-65, I format).

*INPUT - logical unit number from which the ADSEP data set is to be read (right justified in Columns 69-70, I format).

IADV - provides for the plotting of several sets of data (with different symbols) on the same graph. Blank or positive to begin a new plot, negative to add new data to the previous plot (right justified in Columns 79-80, I format).

SECOND CARD

All items on the second card deal with the *X* axis.

XLABEL - up to 40 characters to serve as the label for the *X* axis (Columns 1-40, A format).

MNFLGX - flag to indicate that the user wishes to specify the minimum value for establishing the scale for the *X* axis. If an *X* is read, the program will read the minimum value from the card; otherwise, it will determine the minimum value by searching the data (Column 41, A format).

MINX - minimum value to be used in establishing the scale for the *X* axis (Columns 42-50, F format).

MXFLGX - flag to indicate that the user wishes to specify the maximum value for establishing the scale for the *X* axis. If an *X* is read, the program will use the value of MAXX read from the

*Only those fields marked are absolutely necessary. All others can be supplied by default if the user desires.

card; otherwise, it will determine the maximum value by searching the data (Column 51, A format).

MAXX - maximum value to be used in establishing the scale for the *X* axis (Columns 52-60, F format).

XSP - the length of the *X* axis on the plot in inches. If this field is left blank, the default value of 9.0 inches will be used (Columns 66-70, F format).

XFUN - function to be used to transform the *X* axis. Currently only two functions are available; if LØGØ appears in this field, the common logarithm of the *X* values will be plotted rather than the actual values. If RECP appears, degrees C will be converted to 1/Deg. K(Columns 77-80, A format).

All of the fields on this card are optional. The program will run with a completely blank card, although no label would appear on the *X* axis. Usually the user will insert a label in the first 40 columns and leave the rest of the card blank. In this case the program will find the maximum and minimum values of *X*, select a convenient scale encompassing these extremes and scale all values accordingly.

THIRD CARD

This card contains variables concerning the *Y* axis which are exactly analogous to those for the *Y* axis. The only difference is that the default value for YSP is 6.0 inches. As with the *X* axis, all variables for the *Y* axis are optional.

FOURTH CARD

All 80 columns of this card are available for a caption for the graph.

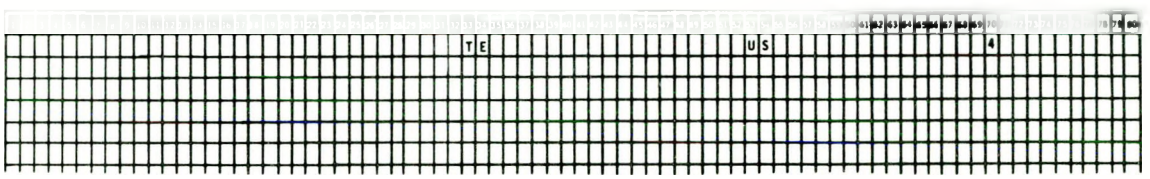
These four cards must be followed by two blank cards, making a total of six cards for each graph. Several such sets of cards may be stacked in sequence to produce several plots in one computer run. Naturally, a DD card for each logical unit to be accessed must be present.

It is hoped that the following examples will most clearly illustrate the use of the program.

Simplest Plot

As the foregoing discussion implies, six cards are needed for each plot. The last two must always be blank. Of those variables read, only three on the first card are truly necessary. As one would expect, the program must be told in which fields of the ADSEP record the data are to be found and the logical unit on which the data set resides. Hence, the simplest input would consist of a card containing the identifier of the *X* field, the identifier of the *Y* field, and the logical unit number from which the data are to be read followed by five blank cards as follows:

ORNL-DWG 76-9615

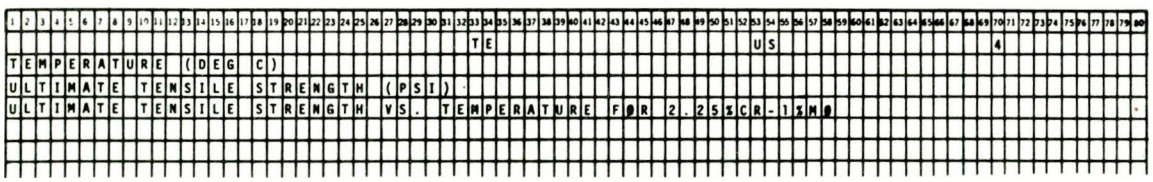


The resulting plot is shown in Fig. 1. Naturally, the axis labels and the captions are blank.

Labeled Plots

Most frequently the user will probably choose to specify labels for the axis and a caption while accepting defaults for all other parameters. The label for the *X* axis is punched in Columns 1-40 of the second card. Similarly, the label for the *Y* axis is punched in the same columns of the third card while all 80 columns of the fourth card are reserved for the caption. Input cards for the plot shown in Fig. 2 are as follows:

ORNL-DWG 76-9616



Specifying the Length of Axes

At times it is desirable to change the length of the axes of a plot, e.g., to create a vertical format. This is done by specifying the parameters XSP and YSP on the appropriate axis cards. The default lengths for the *X* and *Y* axes are 9 inches and 6 inches, respectively. To create the plot shown in Fig. 3, the length of the *X* axis was changed to 6 inches and the length of the *Y* axis was changed to 8 inches. As shown in the following card images, the desired length for each axis, in inches, is specified in columns 66 through 70 of the appropriate axis card.

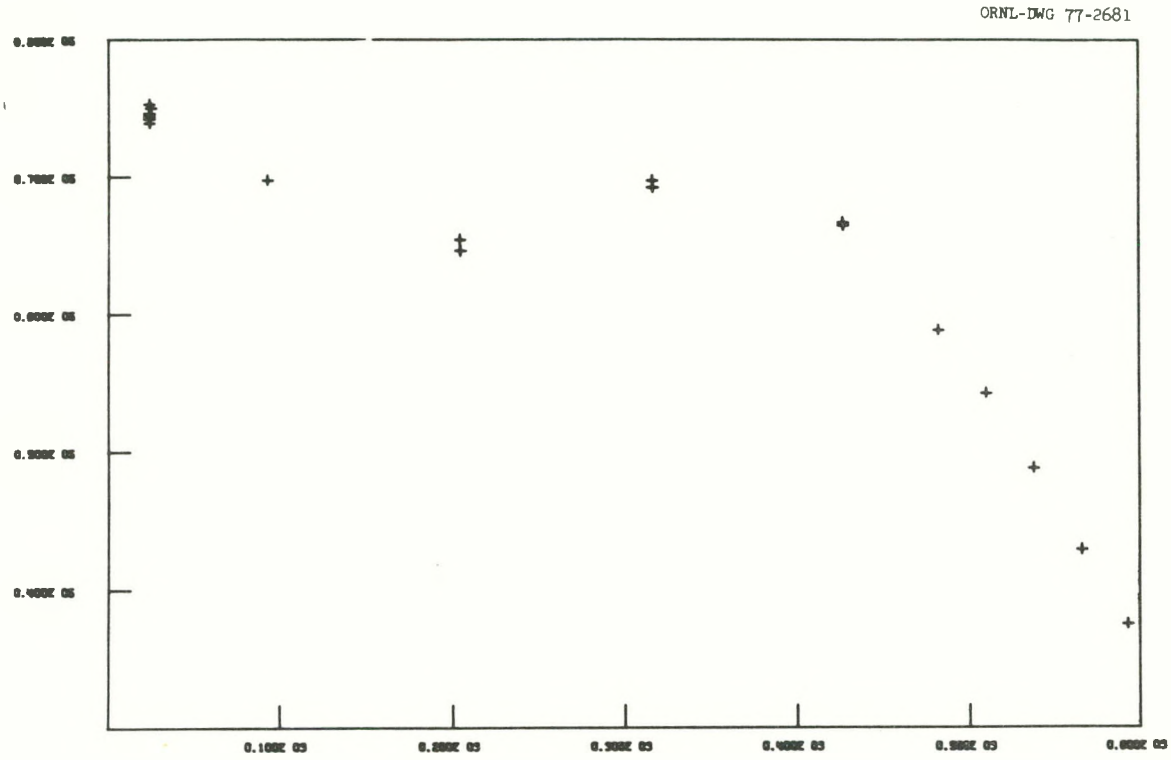
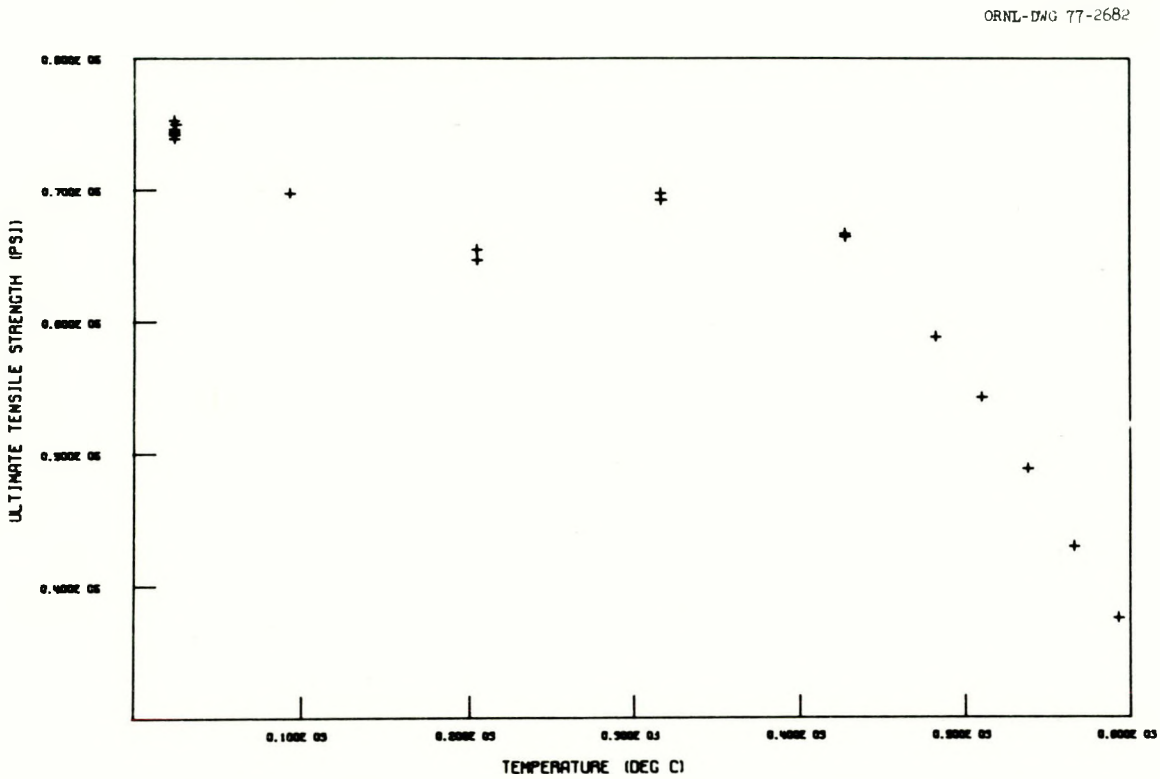


Fig. 1. Plot Illustrating the Use of All Possible Defaults.



ULTIMATE TENSILE STRENGTH VS. TEMPERATURE FOR 2.25%CR-1%MO

Fig. 2. Plot Illustrating the Use of Labels.

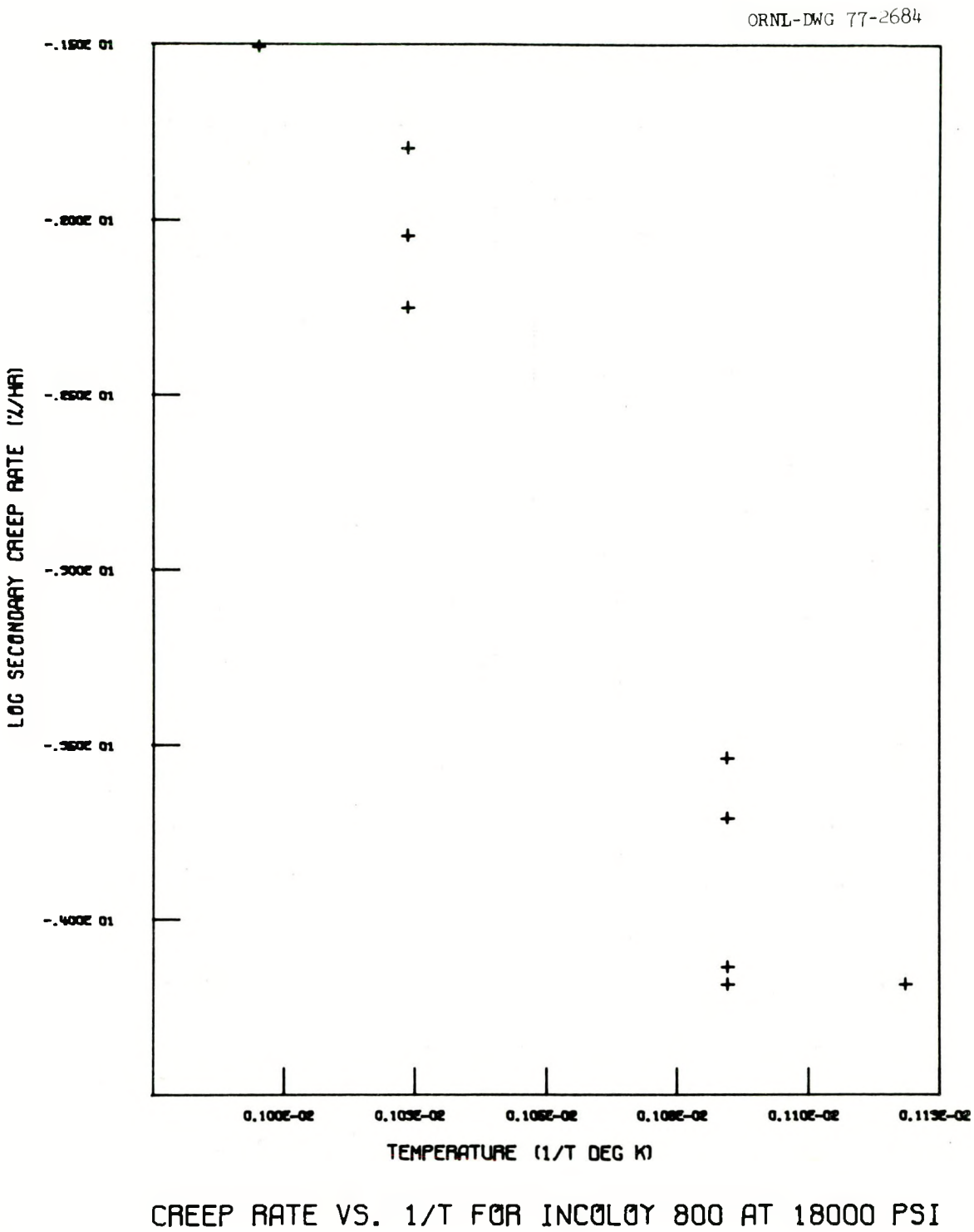
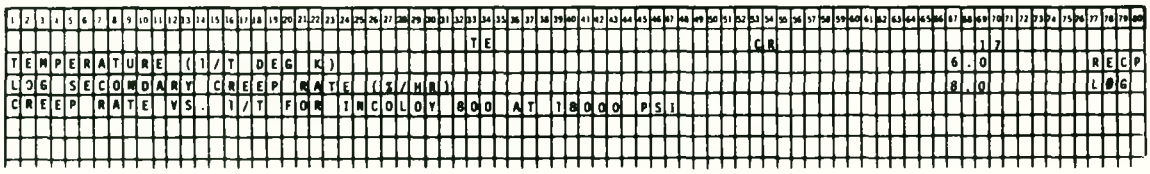


Fig. 3. Plot Illustrating the Control of Axis Length and Data Transformation.

ORNL-DWG 76-9614



The terms 'LOG and 'RECP' do not pertain to the axis length and will be discussed in the next section.

Transformations

Rather than plot the actual values, it is frequently desirable to perform some transformation before plotting, e.g., taking logarithms. Referring again to the illustration in the previous section, input to the variables XFUN and YFUN in columns 77-80 of the axis cards is used to perform such transformations. Currently only two transformations are implemented. If the characters 'LOG' appear in columns 77-80, each data value on that axis will be replaced by the common logarithm of the value. Similarly, if the characters 'RECP' appear, each value will be replaced by the reciprocal of the value plus 273, i.e., x=1/(x+273). The data set from which Fig. 3 was plotted contained the creep rate in percent per hour and temperature in degrees C. Using 'RECP' to transform the *X* axis and 'LOG' to transform the *X* axis produces a plot log creep rate vs. reciprocal temperature.

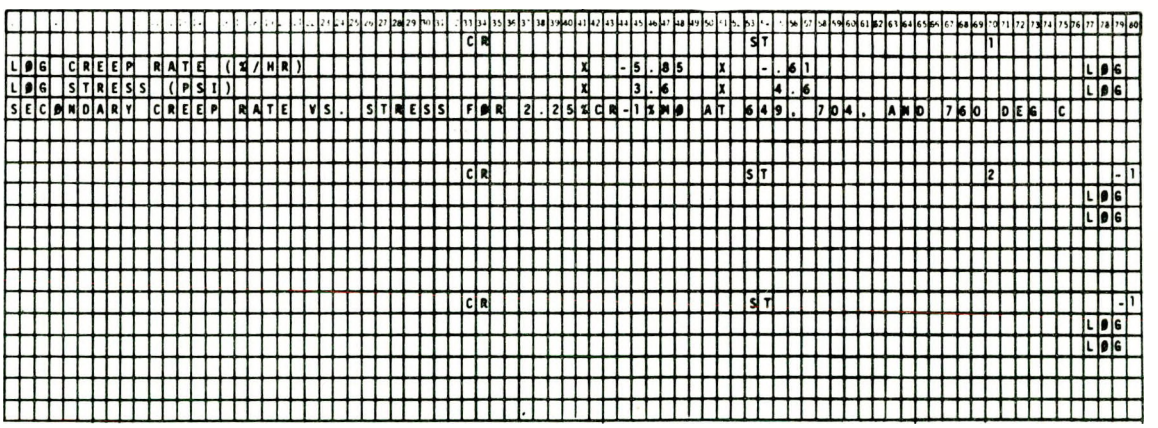
Although, only two such transformations are provided within the program, additional flexibility is afforded by the use of subroutine

FLXTRN. If the characters 'FLXT' appear in columns 77-80 of either axis card, the program will issue a call to subroutine FLXTRN. The user may supply a subroutine containing coding to perform any transformation which he desires. A sample subroutine is given in Appendix A. It should be noted that only one array is provided for each axis; the transformed data must be stored in the same locations as the original data, thus destroying the original values. (This applies only to values in core, the data on the data set from which the values were read are undisturbed.)

Multiple Plots

The user may superimpose data from several data sets on the same graph using the IADV parameter. The following example illustrates the superpositions of creep rate vs. stress data at three temperatures from three separate data sets (Fig. 4).

ORNL-DWG 76-9618



DATA SHEET (80 column)

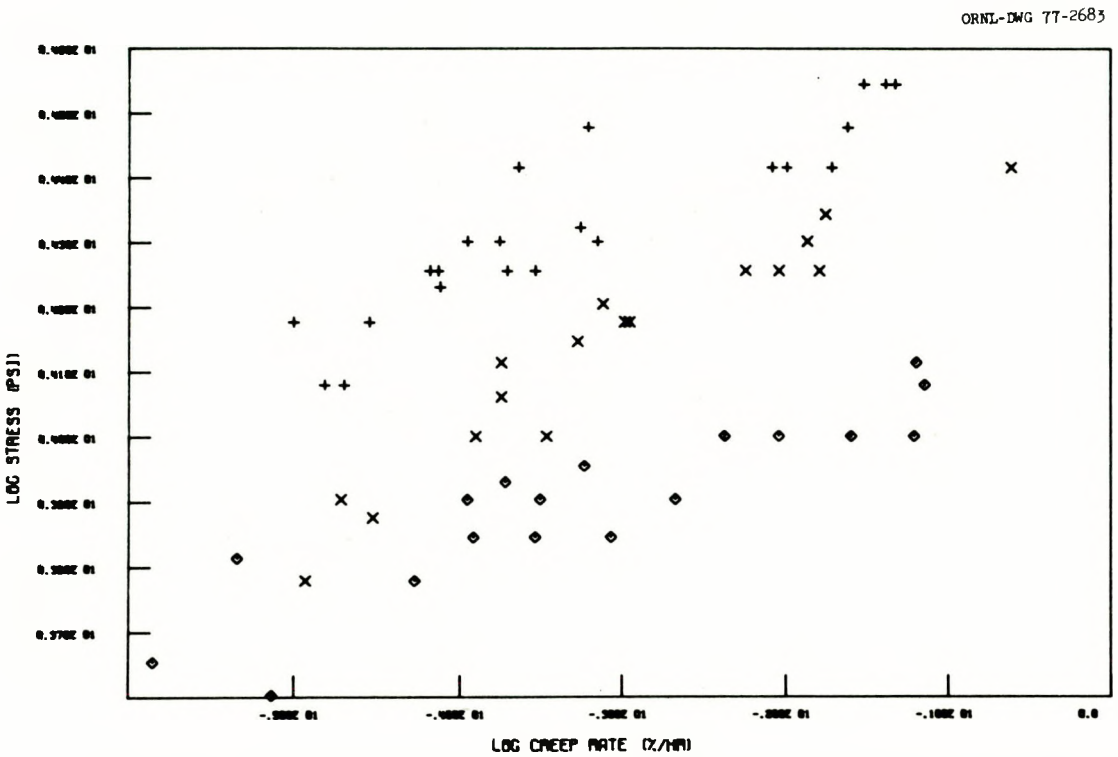


Fig. 4. Plot Illustrating the Superposition of Several Data Sets and Specification of Maxima and Minima.

Input data are much like data for separate plots with three exceptions. The IADV parameter must be set to a negative value on all plots after the first. (A negative value must not be used on the first set.) Second, the axis labels need only be specified on one of the plots. Finally, the user is responsible for insuring that the axes span an appropriate range of values on the first plot so that all values on subsequent plots will be contained within the boundaries of the graph. If one of the data sets spans a sufficient range in both *X* and *Y* directions, this requirement may be met by simply selecting it as the first plot. Otherwise, the user may specify appropriate maximum and minimum values for both axes as discussed in the next section.

The following symbols will be repeated in order until all data sets have been plotted – +, X, ◇, □, ○, △.

Specification of Maxima and Minima

If no maximum or minimum values are specified for a given axis, the program will search the corresponding data array to find its maximum and minimum values and select values which will provide a convenient scale for the axis. If the values thus chosen prove aesthetically unsatisfying to the user or if additional space is needed to accommodate data to be read from another data set, the user may specify the maximum and/or minimum values. The card images for the first data set of the previous example illustrate this feature. By inserting an 'X' in column 41 of the *X* axis card, the user indicates that he wishes the number found in columns 42-50 to be used in place

of the minimum data value. Similarly, the '*X*' in column 51 indicates that the number in columns 52-60 is to be used in place of the data maximum. In the same manner the minimum and maximum values are set for the *Y* axis on the next card. It should be emphasized that the values inserted in this manner do not necessarily become the maximum and minimum of the scale but are substituted for the maximum and minimum values found in the data array, from which the scale limits are determined.

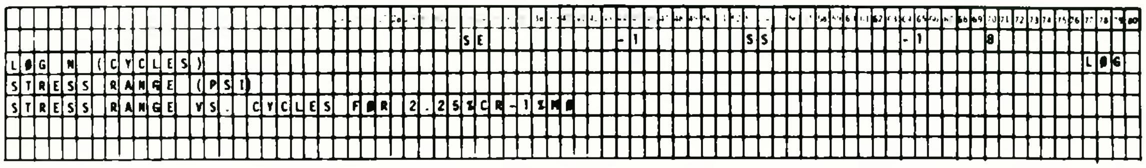
Plotting Items and Lists

An ADSEP identifier may represent a single item (numerical value) or a list of items (several numerical values). The selection of items or lists is done using the ITMNOX (columns 41-45) and ITMNOY (columms 61-65) parameters on the first card of each group. If the appropriate field is left blank, the program assumes that either the field consists of a single item or the first item is to be plotted from the list. If a positive integer is found in this field, the program assumes that it represents the position of the item to be plotted in the list. If a negative number is found, the entire list will be plotted. If, for example, an item is called for in the *X* field while a list is called for in the *Y* field, each value in the *Y* list will be plotted at the same value of *X*.

In the following example, the identifier SS represents a list of stress range values observed in a fatigue test. The identifier SE represents a list containing the number of cycles at which each stress

range was observed. In the following card images, it can be seen that -1 appears in both the ITMNOX field and the ITMNOY field.

ORNL-DWG 76-9617



Accordingly, the *X* array was filled with the values from the SE list while the *Y* array was filled with the values from the SS list. The resulting plot is shown in Fig. 5.

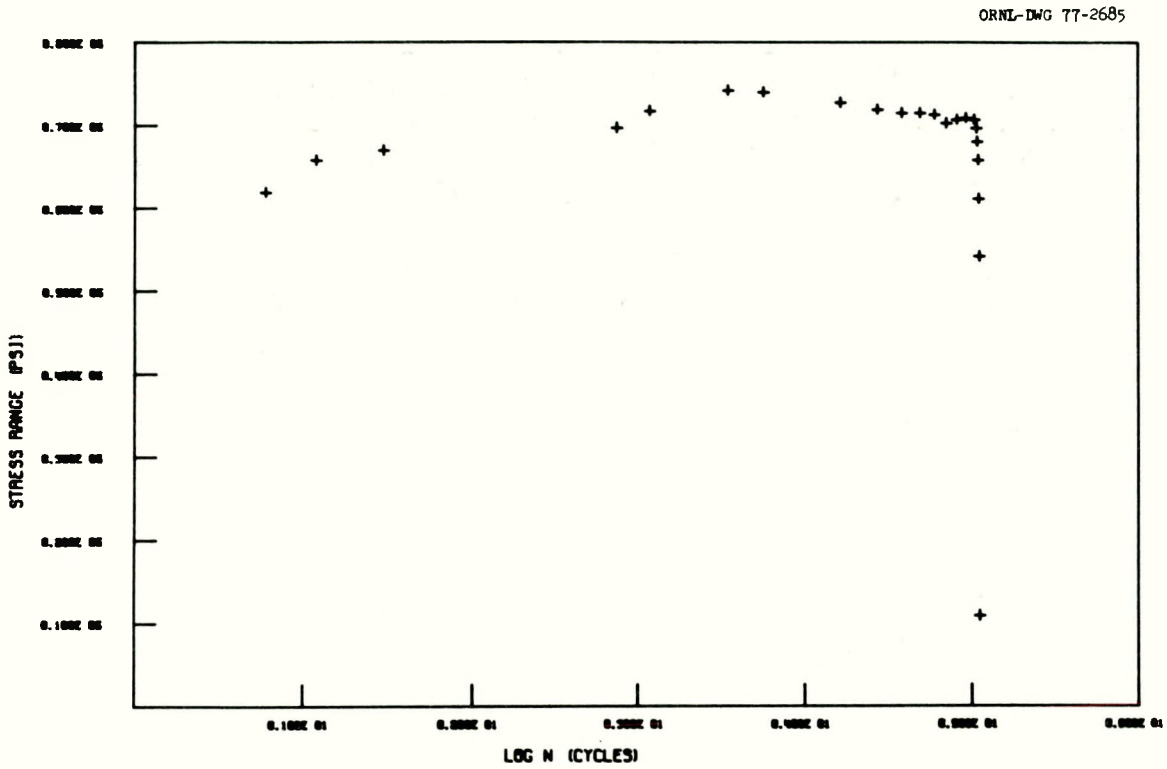


Fig. 5. Plot Illustrating the Plotting of Lists.

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1. A. A. Brooks, *ADSEP, An Automated Data Set Editing Program*, CTC-34, May 12, 1970.

2. V. A. Singletary, *An On-Line Conversational Retrieval System for ORCHIS Text-Oriented Data Bases User's Manual*, ORNL-4951, Rev. 1, May 1975.

3. A. A. Brooks, *Oak Ridge Computerized Hierarchical Information System (ORCHIS) Status Report - July 1973*, ORNL-4929, January 1974.

APPENDIX A

LEVEL 21.6 (DEC 72) OS/360 FORTRAN H

```
          COMPILER OPTIONS - NAME=  MAIN,OPT=02,LINECNT=60,SIZE=0000K,
                             SOURCE,EBCDIC,NOLIST,NODECK,LOAD,MAP,NOEDIT,NOID,XREF
   ISN 0002            SUBROUTINE FLXTRN(X,N)
                     C     X - DATA ARRAY TO BE TRANSFORMED
                     C     N - NUMBER OF DATA ELEMENTS IN ARRAY X
   ISN 0003            REAL*4 X(1)
   ISN 0004            DO 100 I=1,N
   ISN 0005            X(I)=1.0/(X(I)+273.)
   ISN 0006          100 CONTINUE
   ISN 0007            RETURN
   ISN 0008            END
```

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